

ENVIRONMENTAL SCIENCE & MANAGEMENT

Bachelor of Science degree with a major in Environmental Science & Management — with concentrations in:

Ecological Restoration
Energy & Climate
Environmental Education & Interpretation
Environmental Planning & Policy
Geospatial Science
Natural Resources Recreation

Minors

Ecological Restoration
Environmental Education & Interpretation
Environmental & Natural Resources Planning
Environmental Policy
Natural Resources
Natural Resources Recreation

Certificates of Study

Environmental Education & Interpretation
Environmental & Natural Resources Planning
Geospatial Science
Natural Resources Policy & Administration

Master of Science degree in Natural Resources — Environmental & Natural Resources Science option

Department Chair

Steven R. Martin, Ph.D.

Environmental Science & Management

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Associated Faculty & Advisors

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The Program

Students completing this program will have demonstrated:

- the ability to apply science to understanding ecosystems and natural resources
- the ability to understand the policy and social implications of environmental issues.

- the knowledge and skills to understand, analyze, address and manage the consequences of human actions on the physical, biological, and cultural world.

- the knowledge and skills to seek out the information and resources necessary to understand complex environmental issues.

- the writing, speaking, and electronic communication skills needed to communicate with the public and professionals concerning the environmental sciences.

- the ability to apply critical thinking skills as the basis for decision making and sound value judgments.

Graduates should find work with state, federal, and local governments, nonprofit conservation organizations, private sector consulting firms (particularly those dealing with environmental impact analysis, environmental planning, wetlands delineation, environmental restoration, geospatial applications in natural resources, energy technology and planning, and natural resource management), or go on to professional and graduate schools to study ecology, environmental law, environmental planning, human dimensions of natural resources, outdoor recreation management, geospatial science, natural resources management, wilderness management, public administration, or environmental policy.

Preparation

High school students need strong academic preparation in math, writing, and the sciences.

REQUIREMENTS FOR THE MAJOR

For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see "The Bachelor's Degree" section of the catalog, pp. 66-80, and "The Master's Degree" on page 81-80.

Complete all courses in the major with a C- or better.

Core Courses (20 units)

ESM 105	(3) Natural Resource Conservation
ESM 111	(1) Environmental Science Seminar
GSP 101	(2) Geospatial Concepts and
GSP 101L	(1) Geospatial Concepts Lab
ESM 230	(3) Environmental Methods
ESM 303	(4) Applied Natural History & Ecology

ESM 305 (3) Environmental Conflict Resolution

ESM 325 (3) Environmental Law & Regulation

Select one of the following concentrations:

Ecological Restoration Concentration

Core courses plus:

Lower Division

BIOL 105 (4) Principles of Biology

BOT 105 (4) General Botany

CHEM 107 (4) Fundamentals of Chemistry

GSP 270 (3) Geographic Information Science (GIS)

SOIL 260 (3) Intro to Soil Science

STAT 109 (4) Introductory Biostatistics*

Upper Division

BOT 350 (4) Plant Taxonomy

ESM 355 (3) Principles of Ecological Restoration

ESM 425 (3) Environmental Impact Assessment

ESM 435 (2) Grant Writing

ESM 455 (4) Applied Ecological Restoration

WSHD 310 (4) Hydrology & Watershed Management

Take one of the following:

FISH 470 (3) River Fish Restoration Ecology* **or**

FOR 431 (3) Forest Restoration, **or**

RRS 430 (3) Wildland Restoration & Development*

Take two upper division courses approved by your advisor; from BOT, ESM, FISH, FOR, GEOL, GSP, RRS, SOIL, WSHD, or WLDF. (Prerequisites may be required for some courses, depending on choice.)

NOTE: 24 units may double-count toward GE requirements.

* Course requires one or more prerequisites that are not required elsewhere in the major.

Energy & Climate Concentration

Core courses plus:

Lower Division

BIOL 105	(4) Principles of Biology, or
BOT 105	(4) General Botany
CHEM 107	(4) Fundamentals of Chemistry**
ECON 104	(3) Contemporary Topics in Economics
MATH 105	(3) Calculus for the Biological Sciences & Natural Resource*
PHYX 106	(4) College Physics: Mechanics & Heat
PHYX 107	(4) College Physics: Electromagnetism & Modern Physics
STAT 109	(4) Introductory Biostatistics*

Upper Division

ECON 450	(4) Energy Economics & Climate Policy
ENGR 305	(3) Appropriate Technology
ENGR 371	(3) Energy Systems & Technology
ESM 370	(3) Energy, Technology & Society
ESM 411	(3) Sustainable Campus
ESM 425	(3) Environmental Impact Assessment

Take two climate science courses:

CHEM 370	(3) Earth System Chemistry
OCN 420*	(3) Oceans and Climate
WSHD 458	(3) Climate Change & Land Use

Take two tools courses:

ECON 423	(3) Environmental & Natural Resource Economics
ESM 309B	(3) Environmental Communication
ESM 435	(3) Grant Proposal Writing
GSP 270	(3) Geographic Information Science (GIS)
GEOG 301	(3) Int'l Environmental Issues & Globalization

NOTE: 24 units may double-count toward GE requirements.

Environmental Education & Interpretation Concentration

Core courses plus:

GEOL 109	(4) Introduction to Geology, or
SOIL 260	(3) Introduction to Soil Science
STAT 108	(4) Elementary Statistics, or
STAT 109	(4) Introductory Biostatistics*
BOT 105	(4) General Botany, or
BIOL 105	(4) Principles of Biology

GEOG 106	(3) Physical Geography, or
CHEM 107	(4) Fundamentals of Chemistry, or
PHYX 104	(4) Descriptive Astronomy
ESM 210	(3) Public Land Use Policies & Management
ESM 215	(3) Natural Resources & Recreation
ESM 253	(3) Interpretive Computer Graphics
CD 256	(3) Middle Childhood Development, or
PSYC 213	(3) The School-Age Child
ESM 350	(3) Fundamentals of Environmental Education & Interpretation
ESM 351	(1) Environmental Interpretation Field Trip
ESM 353	(3) Environmental Education & Interpretation Graphics
ESM 430	(3) NR Management in Protected Areas
ESM 450	(3) Applied Environmental Education & Interpretation
ESM 453	(4) Environmental Education & Interpretation Practicum (capstone)
ESM 482	(2) Internship, or
ESM 499	(2) Directed Study

Take one skills course:

ART 340	(3) Graphic Design II
ART 356	(3) Museum & Gallery Practices
ESM 309B	(3) Environmental Communication
ESM 425	(3) Environmental Impact Assessment
GSP 270	(3) Geographic Information Science (GIS)
REC 330	(3) Adventure Theory & Practice

Plus one upper division science or natural resources depth course approved by advisor (3 units).

NOTE: 24 units may double-count toward GE requirements.

Environmental & Natural Resources Recreation Concentration

Core courses plus:

STAT 108	(4) Elementary Statistics, or
STAT 109	(4) Introductory Biostatistics*
BIOL 105	(4) Principles of Biology, or
BOT 105	(4) General Botany
CHEM 107	(4) Fundamentals of Chemistry**
ESM 210	(3) Public Land Use Policies & Management

ESM 215	(3) Natural Resources & Recreation
SOIL 260	(3) Intro to Soil Science
GSP 270	(3) Geog. Inform. Sciences
FOR 374	(3) Wilderness Area Management
ESM 415	(3) Recreation & Park Planning (alternate years)
ESM 425	(3) Environmental Impact Assessment
ESM 430	(3) NR Management in Protected Areas
ESM 435	(2) Grant Proposal Writing
ESM 440	(2) Managing Recreation Visitors &
ESM 440L	(1) Managing Recreation Visitors Lab
ESM 482	(2) Internship, or
ESM 499	(2) Directed Study

Take one of the following skills courses:

ESM 253	(3) Interpretive Computer Graphics
ESM 309B	(3) Environmental Communication
ESM 350	(3) Fundamentals of Environmental Education & Interpretation
GSP 330	(3) Mobile Mapping
GSP 370	(3) Intermediate GIS

Plus one upper division natural resources management course (3 units), approved by advisor, from FISH, FOR, ESM, RRS, SOIL, WSHD, WLDF.

NOTE: 24 units may double-count toward GE requirements.

Environmental Planning & Policy Concentration

Core courses plus:

Lower Division

CHEM 107	(4) Fundamentals of Chemistry**
BOT 105	(4) General Botany
STAT 108	(4) Elementary Statistics, or
STAT 109	(4) Introductory Biostatistics*
ESM 210	(3) Public Land Use Policies & Management
GSP 270	(3) Geographic Information Science (GIS)

* Course requires one or more prerequisites that are not required in the major.

** CHEM 109 & CHEM 110 may be substituted for CHEM 107.

Upper Division

ESM 360	(3)	Intro to Environmental Planning Methods
ESM 365	(3)	Local Government Planning
ECON 423	(3)	Environmental & NR Economics
ESM 425	(3)	Environmental Impact Assessment
ESM 435	(2)	Grant Proposal Writing
ESM 460	(3)	Environmental Planning for Public Lands & Rural Communities, or
ESM 462	(3)	Coastal & Marine Planning
ESM 475	(4)	Senior Practicum (Capstone)
ESM 482	(2)	Internship, or
ESM 499	(2)	Directed Study
Take one ecology & management course:		
ESM 355	(3)	Principles of Ecological Restoration
ESM 370	(3)	Energy Technology & Society
ESM 420	(3)	Ecosystem Analysis
ESM 430	(3)	Natural Resource Management in Protected Areas
FOR 321	(3)	Fire Ecology
FOR 374	(3)	Wilderness Area Management
FISH 476	(3)	Ecology of Running Waters*
WLDF 460	(3)	Conservation Biology*

Take one natural resource science fundamentals course:

FOR 130	(3)	Dendrology
GEOL 109	(3)	General Geology
SOIL 260	(3)	Intro to Soil Science
BOT 350	(4)	Plant Taxonomy*
WSHD 310	(4)	Hydrology & Watershed Management

Take two upper division policy and management courses, chosen from a list of approved courses provided by your advisor; from ENGR, FISH, FOR, GEOG, NAS, PHIL, PSCI, RRS, SOIL, WSHD, WLDF. [Prerequisites may be required for some courses, depending on choice.]

NOTE: 24 units may double-count toward GE requirements.

* Course requires one or more prerequisites that are not required in the major.

Geospatial Science Concentration

Core courses plus:

Lower Division

GEOG 106	(3)	Physical Geography
STAT 109	(4)	Introductory Biostatistics*
GSP 216	(3)	Intro to Remote Sensing
GSP 270	(3)	Geographic Information Science (GIS)

Upper Division

GSP 316	(4)	Cartography
GSP 318	(3)	Geospatial Programming I
GSP 326	(3)	Intermediate Remote Sensing
GSP 330	(3)	Mobile Mapping
GSP 370	(3)	Intermediate GIS
GSP 436	(3)	Advanced Remote Sensing, or
GSP 470	(3)	Advanced GIS
ESM 410	(3)	Environmental Science Practicum (capstone)
ESM 425	(3)	Environmental Impact Assessment
ESM 435	(2)	Grant Proposal Writing

Take one natural resources depth or course approved by advisor; minimum three units:

ESM 360	(3)	Intro to Environmental Planning Methods
ESM 430	(3)	Natural Resource Mgmt. in Protected Areas
FISH 220	(3)	Water Resources & Conservation
FISH 260	(3)	Fish Conservation & Mgmt.
FISH 300	(3)	Intro to Fishery Biology
FOR 302	(3)	Forest Ecosystems & People
FOR 307	(3)	California's Forests & Woodlands
GEOL 300	(3)	Geology of California*
GEOL 303	(3)	Earth Resources & Global Environmental Change*
GEOL 306	(3)	General Geomorphology*
GEOL 308	(3)	Natural Disasters
OCN 301	(3)	Marine Ecosystems — Human Impact
OCN 304	(3)	Resources of the Sea
RRS 306	(3)	Wildland Resource Principles
WSHD 310	(4)	Hydrology & Watershed Management
WSHD 333	(3)	Wildland Water Quality
WLDF 301	(3)	Principles of Wildlife Mgmt.
WLDF 468	(3)	Spatial Wildlife Ecology

NOTE: 27 units may double-count toward GE requirements.

REQUIREMENTS FOR THE MINORS

Ecological Restoration Minor

Required Courses

BOT 105	(4)	General Botany
SOIL 260	(3)	Intro to Soil Science
ESM 355	(3)	Principles of Ecological Restoration

Take one restoration course:

FISH 470	(3)	River Fish Restoration Ecology
FOR 431	(3)	Forest Restoration
RRS 430	(3)	Wildland Restoration & Development

Take one of the following elective courses (or course approved by ESM Program Coordinator):

BIOL 330	(4)	Principles of Ecology
BOT 330	(2)	Plant Ecology, and
BOT 330L	(1)	Plant Ecology Lab
BOT 350	(4)	Plant Taxonomy
ESM 420	(3)	Ecosystem Analysis
FISH 310	(4)	Ichthyology
FISH 320	(3)	Limnology
FISH 476	(3)	Ecology of Running Waters
FOR 130	(3)	Dendrology
FOR 131	(3)	Forest Ecology
FOR 321	(3)	Fire Ecology
FOR 430	(3)	Forest Ecosystems
GEOL 306	(3)	General Geomorphology
RRS 306	(3)	Rangeland Resource Principles
SOIL 360	(3)	Origin & Classification of Soils
SOIL 363	(3)	Wetland Soils
WLDF 301	(3)	Principles of Wildlife Mgmt.
WLDF 430	(3)	Ecology & Management of Wetland Habitats for Wildlife
WLDF 460	(3)	Conservation Biology
WSHD 310	(4)	Hydrology & Watershed Management

Environmental Education & Interpretation Minor

ESM 215	(3)	Natural Resources & Recreation
ESM 253	(3)	Interpretive Computer Graphics [or equivalent]
ESM 350/351	(3/1)	Fundamentals of Environmental Education & Interpretation, and Field Trip
ESM 353	(3)	Environmental Education & Interpretation Graphics
ESM 430	(3)	NR Management in Protected Areas
ESM 450	(3)	Applied Environmental Education & Interpretation

Environmental & Natural Resources Planning Minor

- GEOG 106 (3) Physical Geography
- ESM 105 (3) Natural Resource Conservation
- ESM 210 (3) Public Land Use Policies & Management
- ESM 360 (3) Intro to Environmental Planning Methods

Plus two courses from the following:

- ESM 325 (3) Environmental Law & Regulation
- ESM 365 (3) Local Government Planning
- ESM 425 (3) Environmental Impact Assessment

Environmental Policy Minor

- ESM 105 (3) Natural Resources Conservation
- ESM 210 (3) Public Land Use Policies & Management
- ESM 325 (3) Environmental Law & Regulation
- ESM 425 (3) Environmental Impact Assessment
- PSCI 306 (3) Environmental Politics

Take one course from the following:

- ECON 423 (3) Environmental & Natural Resource Economics
- NAS 332 (3) Environmental Justice
- PSCI 317 (1-4) Public Policy Process
- PSCI 352 (4) Water Politics
- PSCI 364 (4) Technology & Development
- PSCI 373 (4) Politics of Sustainability
- PSCI 412 (4) Legal Research
- WSDH 430 (3) Water Rights/Water Law

Natural Resources Minor

- BIOL 105 (4) Principles of Biology
- ESM 105 (3) Natural Resource Conservation
- SOIL 260 (3) Introduction to Soil Science

At least three courses from the following (at least six units must be 300 or above):

- ESM 210 (3) Public Land Use Policies & Management
- ESM 215 (3) Natural Resources & Recreation
- ESM 365 (3) Local Government Planning
- FISH 300 (3) Introduction to Fishery Biology
- FOR 315 (3) Forest Management
- FOR 374 (3) Wilderness Area Mgmt.
- OCN 301 (3) Marine Ecosystems — Human Impact
- OCN 304 (3) Resources of the Sea

- RRS 306 (3) Wildland Resource Principles
- WLDF 301 (3) Principles of Wildlife Management

Natural Resources Recreation Minor

- ESM 210 (3) Public Land Use Policies & Management
- ESM 215 (3) Natural Resources & Recreation
- ESM 305 (3) Environmental Conflict Resolution, **or**
- ESM 309B (3) Environmental Communication
- FOR 374 (3) Wilderness Area Mgmt.
- ESM 415 (3) Recreation & Park Planning, **or**
- ESM 440 (2) Managing Recreation Visitors
- ESM 430 (3) NR Management in Protected Areas

